

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

The office action of January 12, 2007 acted upon claims 24-44. Claims 24-44 were rejected under 35 USC, section 103 (a). By this response, claims 24-44 have been canceled without prejudice, and new claims 45-64 have been presented in the belief that they recite allowable subject matter.

The instant application is eligible for continued examination under 37 CFR 1.114. A request for continued examination under 37 CFR 1.114 is being filed concurrently with this response. The request for continued examination includes payment of the fee set forth in 37 CFR 1.17(e).

§ 103 Rejections

The Examiner has rejected claims 24-29, 32-36, and 40-44 under § 103(a) as being unpatentable over the E.S.T. Electrolysis System brochure (henceforth, "E.S.T. brochure") in view of U.S. Patent No. 3,951,161 to Rohrback et al. (henceforth, "Rohrback"), "for reasons of record".

The Examiner has rejected claims 31 and 37-39 under § 103(a) as being unpatentable over the E.S.T. brochure in view of Rohrback as applied to claims 24-29, 32-36, and 40-44, and further in view of U.S. Patent No. 4,331,525 to Huba et al. (henceforth, "Huba"). The Examiner's rejections are respectfully traversed.

With regard to Huba, Huba indeed discloses an electrolytic process for PVC separation and recovery at constant electric current. However, it is well established that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting that combination. Huba does not disclose that the use of constant current is advantageous, rather Huba teaches that the combination of ultrafiltration and an electrolytic process employing constant current is efficacious with respect to an electrolytic process employing constant current, but without ultrafiltration. Thus, Huba teaches that the constant current process, without ultrafiltration, is inefficient and disadvantageous. In any event, Applicant respectfully submits that there is no teaching, suggestion, or incentive supporting the combination of references made by the Examiner.

With regard to the "reasons of record" used to reject claims 24-29, 32-36, and 40-44, the Examiner had articulated in the previous Office Action that Rohrback shows that it is known in the art to measure the resistance and/or thickness and to derive appropriate treatment based upon the measurement.

Applicant readily concedes that it is known in the art to measure the resistance and/or thickness of a layer of scale, and to act upon the layer based upon the measurement. The teachings of Rohrback are indeed typical of such art. It must be emphasized, however, that in Rohrback, "measuring the contact resistance" is the sole parameter used to activate the control system (see inter alia, column 3, lines 38-46).

By sharp contrast, many of the original claims (11-14, 19-20) recite limitations pertaining to a timing mechanism configured to trigger the scraper according to a pre-determined time parameter. Similarly, in claims 27-30, 32, 38-39, and 41-44, composed in response to the First Office Action, such limitations are provided.

Applicant respectfully submits that the “reasons of record”, i.e., that “Rohrback shows that it is known in the art to measure the resistance and/or thickness and to derive appropriate treatment based upon the measurement”, is not germane to any of the above-cited claims.

Rohrback does indeed disclose a timing means that may be used in conjunction with his invention:

In accordance with one mode of practicing the present method, the test surface is cleaned on each occasion that adherent scale is sensed. This may be controlled either manually or automatically. For example, relative to the embodiment of FIG. 2, the actuating means 108 may be automatically interrelated with the scale-sensing circuit, in such manner that a high reading of meter 26 causes the actuating means 108 to shift scaaper [sic] 106 against the surface 12a, so that such surface is automatically cleaned preparatory to a new scale-sensing test. Suitable timer means are then employed, to effect automatic withdrawal of scraper 106, after an appropriate time has elapsed.
[column 20, lines 47-59]

However, it is manifest that such timing means are to “effect automatic withdrawal of scraper 106, after an appropriate time has elapsed”, and have

nothing to do with a timing parameter for activating the scraper to effect scraping of the wall.

In sharp contrast to the teachings of Rohrback, in which scale inhibition is the objective, and in which electrical contact resistance is the sole criterion for activating the scraping mechanism to clean the surface, new independent claims 45, 56 and 59 recite limitations relating to a control system adapted to activate the scraper according to a combined function including both (1) a measurement of an electrical property associated with a thickness of said scale deposition, and (2) a pre-determined time parameter. This combination is surprisingly efficacious, as disclosed in the instant Specification:

When the sole criterion for activating the scraper is electrical resistance, I have found that the rate of scale deposition often decreases with time. Without wishing to be bound by theory, I attribute this decrease to various surface effects on the crystalline scale surface, including sliming, which reduce the effective surface area of scale crystals that is available for enhancing additional scale deposition. Such surface effects appear to have little effect on electrical resistance.

Hence, by incorporating an additional criterion – that of maximum time elapsed between scrapings, the deleterious surface effects on the crystalline scale surface are curtailed, and the rate of scale deposition remains substantially constant over time.

[page 14]

Neither the problem, nor the inventive solution embodied by the above-described limitation, is explicit, or fairly suggested, by the cited prior art.

Moreover, Rohrback seemingly teaches away from the inventive solution, by asserting that electrical contact resistance, in and of itself, provides

for extremely sensitive detection of scale formation (see, inter alia, column 7, line 31 – column 8, line 23), to the point that scale formation is readily detected even though no visible scale was apparent to the unaided eye (see, inter alia, column 26, lines 44 – 46).

Furthermore, various engineering considerations known to those skilled in the art teach away from scraping of the wall more frequently than deemed necessary by electrical resistance considerations. These include:

- wear/tearing of scraper/scraping mechanism;
- the scraping operation is associated with a washing cycle to remove the scale from the treated water. Frequent scraping means frequent washing, resulting in:
 - (1) a significantly increased volume of waste effluent containing the scale particles, and
 - (2) a decrease in the volume of the product -- treated water.

Thus, employing a second parameter to scrape the wall more frequently than deemed necessary by electrical resistance considerations runs counter to the engineering common sense of those skilled in the art.

Surprisingly, a highly superior rate of scale removal is achieved by the device and method of the present invention, as is explicitly disclosed in the instant Specification, inter alia, Table 1 (page 11) and the associated text, including page 15, line 14 – page 16, line 3. The Specification clearly articulates

... that control systems based both on electrical resistance (or another parameter correlated with scale deposition thickness) and time interval achieve superior results in terms of the rate of scale deposition on inner wall 20. Specifically, it has been found that by augmenting the electrical resistance criterion with a maximum time elapsed between scrapings criterion greatly improves the performance. [page 13, lines 6-11]

While continuing to traverse the Examiner's rejections, the Applicant has, in order to expedite the prosecution, chosen to compose new claims 45 - 64 in order to clarify and emphasize the crucial distinctions between the device of the present invention and the teachings of the prior art cited by the Examiner.

Specifically, new independent claims 45, 56 and 59 have been composed so as to clarify that the control system is adapted to activate the scraper according to a combined function including both (1) a measurement of an electrical property associated with a thickness of said scale deposition, and (2) a pre-determined time parameter.

New dependent claims 53-55 and 60-62 recite limitations relating to control of the cell such that the calcium hardness in a water flow delivered to the cell is reduced and maintained at a level below about 110 or 55 ppm, on a CaCO_3 basis. By sharp contrast, the closest prior art, such as the device disclosed in the E.S.T. brochure, achieved a level of no less than about 170 ppm, on a CaCO_3 basis, as disclosed in Table 1 and associated text of the instant Specification.


In summary, Applicant believes that the new claims currently before the Examiner completely overcome the Examiner's rejections on § 103 grounds.

New Claims

Support for new claims 45-64 can be found in the Specification. Specifically, independent claims 45 and 56 draw support, inter alia, from original claims 1, 7 and 17. Claims 46 and 57 draw support, inter alia, from original claim 11. Claims 47 and 48 draw support, inter alia, from original claim 7. Claims 49-52 draw support, inter alia, from original claims 12-15. Claims 53-55 and 60-62 draw support from Table 1 and the associated text in the instant Specification. Claims 58 and 63 draw support from Table 1 and the associated text in the instant Specification. Independent claim 59 draws support, inter alia, from original claims 21, 7 and 17. Claims 64 draws support, inter alia, from original claim 18.

In view of the above amendments and remarks it is respectfully submitted that new claims 45-64 are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,



Mark M. Friedman
Attorney for Applicant
Registration No. 33,883

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